AUTOMATED TRAFFIC SIGNAL PERFORMANCE MEASURES

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udot.utah.gov

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AASHTO Innovation Initiative

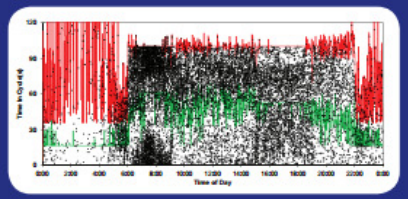
The Need

- How to we manage traffic signals?
- Complaints
- Look at it every few years for a few hours
- Rely on models

- What happens on the weekend stays on the weekend (same with holidays, middle of the night, …)

PERFORMANCE MEASURES FOR TRAFFIC SIGNAL SYSTEMS

An Outcome-Oriented Approach



Christopher M. Day, Darcy M. Bullock, Howell Li, Stephen M. Remias, Alexander M. Hainen, Richard S. Freije, Amanda L. Stevens, James R. Sturdevant, and Thomas M. Brennan

SPM Basic Concept

Automated Data Collection

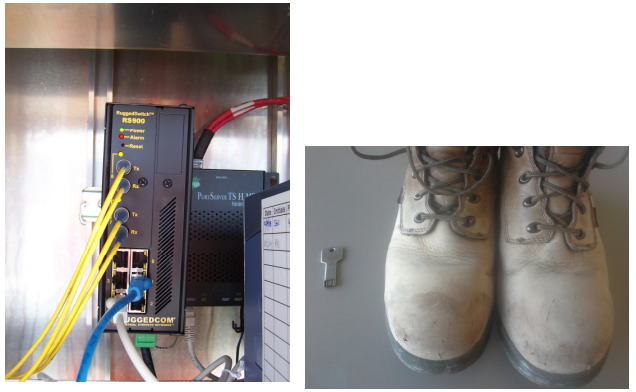
- Signal controller
- Probe source

Useful Information about Performance

- Signal
- Corridor
- System

System Requirements for SPM

High-resolution Controller



Communications

1) Get *.dat* Files
2) Translate Files
   .dat ➡ *.csv*
3) Store in Database

Server

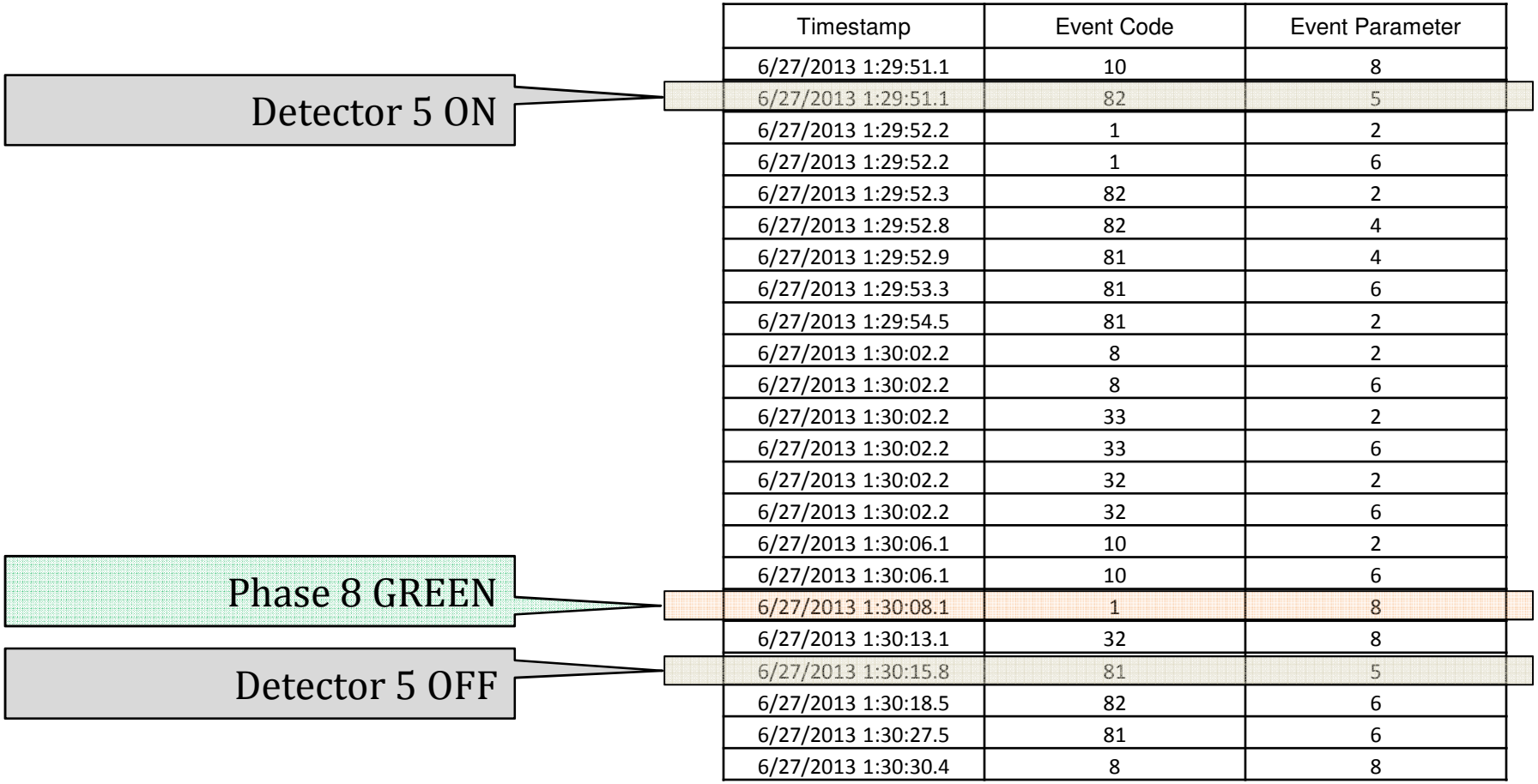
1) Query Database
2) Display Graphs

Website

Detection
(optional)

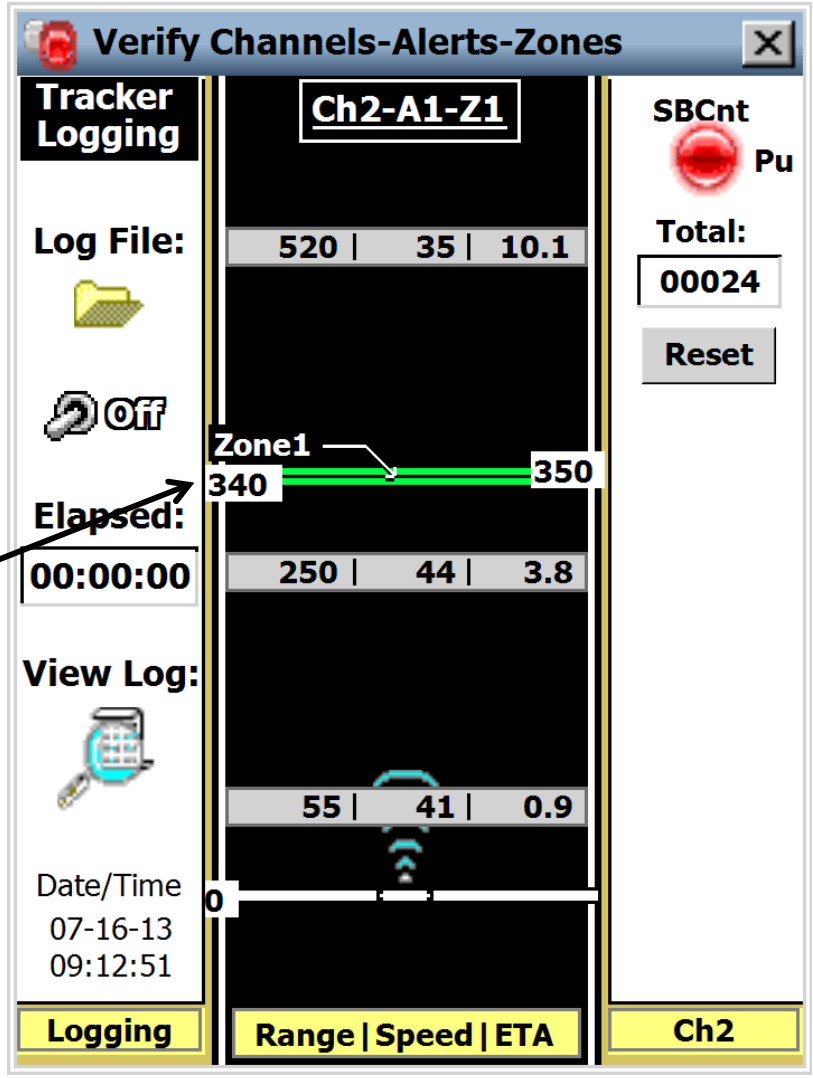
Can be done <u>independent</u> of a central system!

Sample Controller Log



Timestamp	Event Code	Event Parameter
6/27/2013 1:29:51.1	10	8
6/27/2013 1:29:51.1	82	5
6/27/2013 1:29:52.2	1	2
6/27/2013 1:29:52.2	1	6
6/27/2013 1:29:52.3	82	2
6/27/2013 1:29:52.8	82	4
6/27/2013 1:29:52.9	81	4
6/27/2013 1:29:53.3	81	6
6/27/2013 1:29:54.5	81	2
6/27/2013 1:30:02.2	8	2
6/27/2013 1:30:02.2	8	6
6/27/2013 1:30:02.2	33	2
6/27/2013 1:30:02.2	33	6
6/27/2013 1:30:02.2	32	2
6/27/2013 1:30:02.2	32	6
6/27/2013 1:30:06.1	10	2
6/27/2013 1:30:06.1	10	6
6/27/2013 1:30:08.1	1	8
6/27/2013 1:30:13.1	32	8
6/27/2013 1:30:15.8	81	5
6/27/2013 1:30:18.5	82	6
6/27/2013 1:30:27.5	81	6
6/27/2013 1:30:30.4	8	8

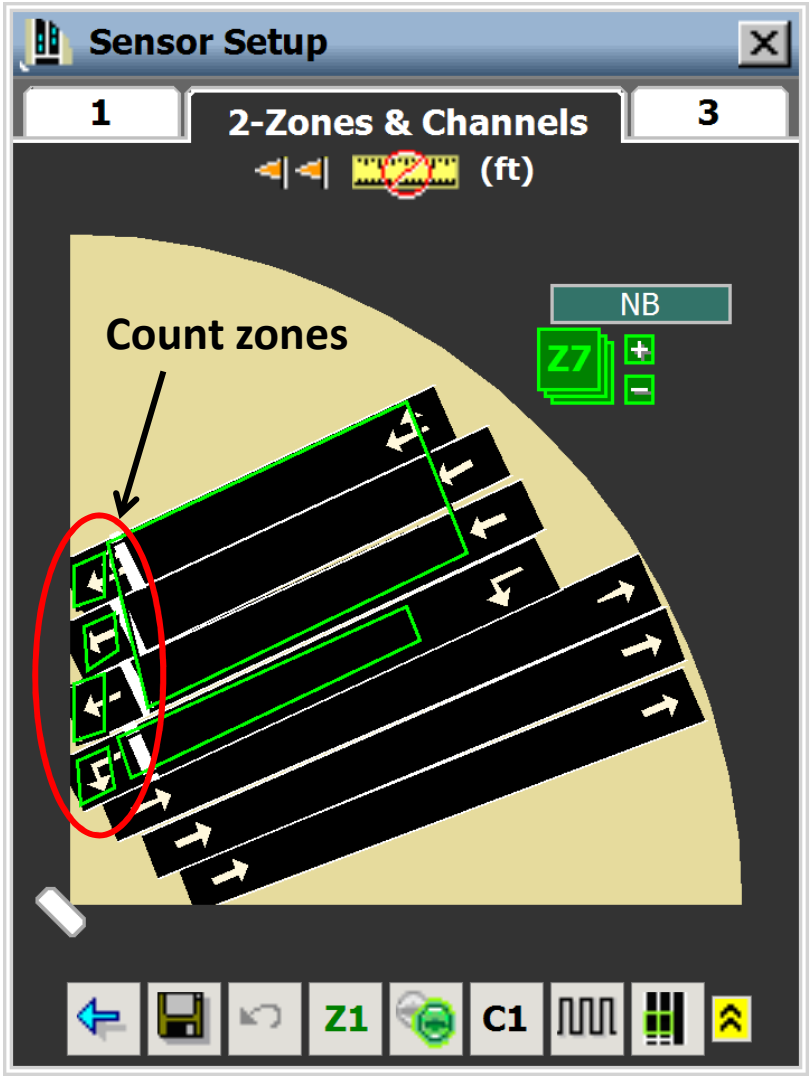
Advance Count Detectors



Wavetronix Advance

- Used to timestamp vehicle arrivals
- 10’ count zone placed ~350’ behind stop bar
- No additional expense if already in place for dilemma zones
- May undercount dense traffic

Stop Bar Count Detectors



Wavetronix Matrix

- Used for turning movement counts
- Lane-by-lane detection zones in front of stop bar
- Requires detection rack card for every two zones ($$$$$$) or Click 650 Detector BIU

Types of Performance Metrics

Controller high-resolution data only

- ★ Purdue Phase Termination
- ★ Split Monitor

Advanced Count Detection (~400 ft behind stop bar)

- ★ Purdue Coordination Diagram
- Approach Volume
- Platoon Ratio
- Arrivals on Red
- Approach Delay
- Executive Summary Reports

Advanced Detection with Speed

- Approach Speed

Lane-by-lane Presence Detection

- Split Failure (future)

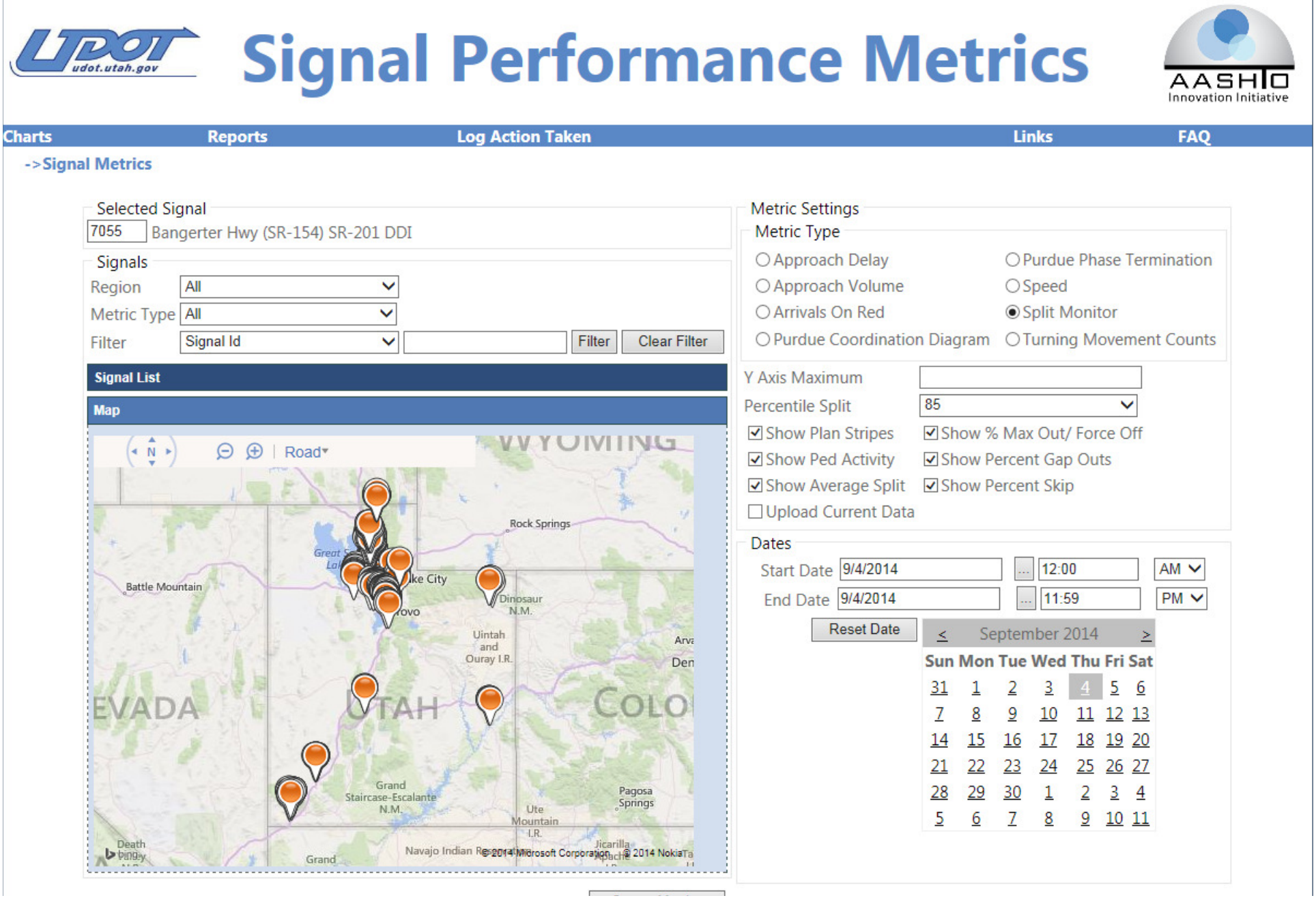
Lane-by-lane Count Detection

- Turning Movement Counts

Probe Travel Time Data (GPS or Bluetooth)

- Purdue Travel Time Diagram

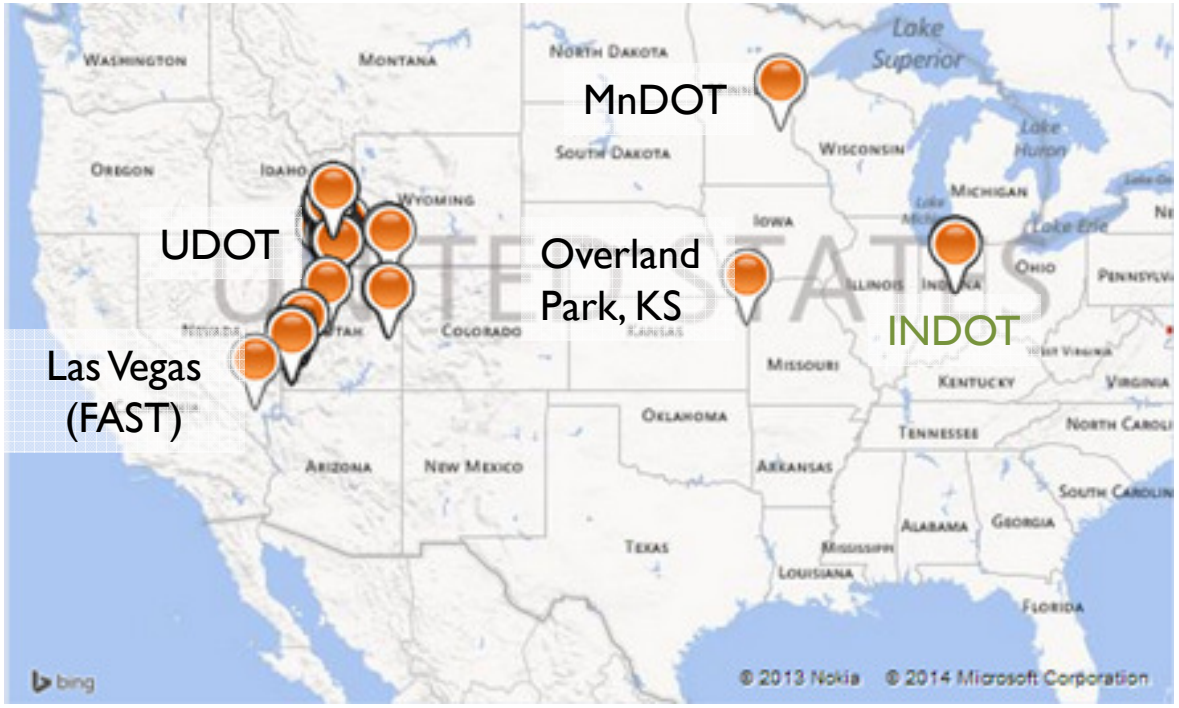
Signal Performance Metrics



http://udottraffic.utah.gov/signalperformancemetrics

Agencies using UDOT SPM Software

Others are in the works
Ask us if you're interested!



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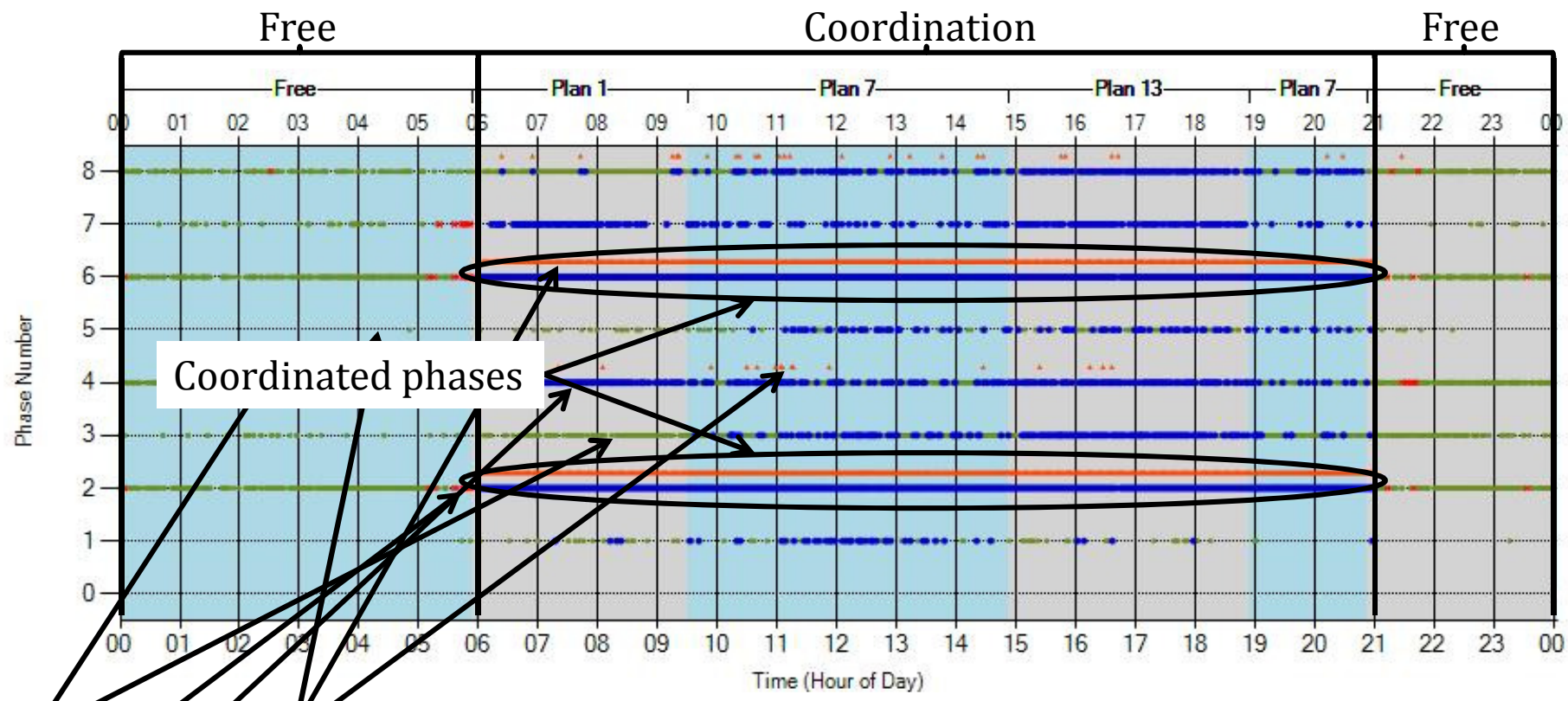
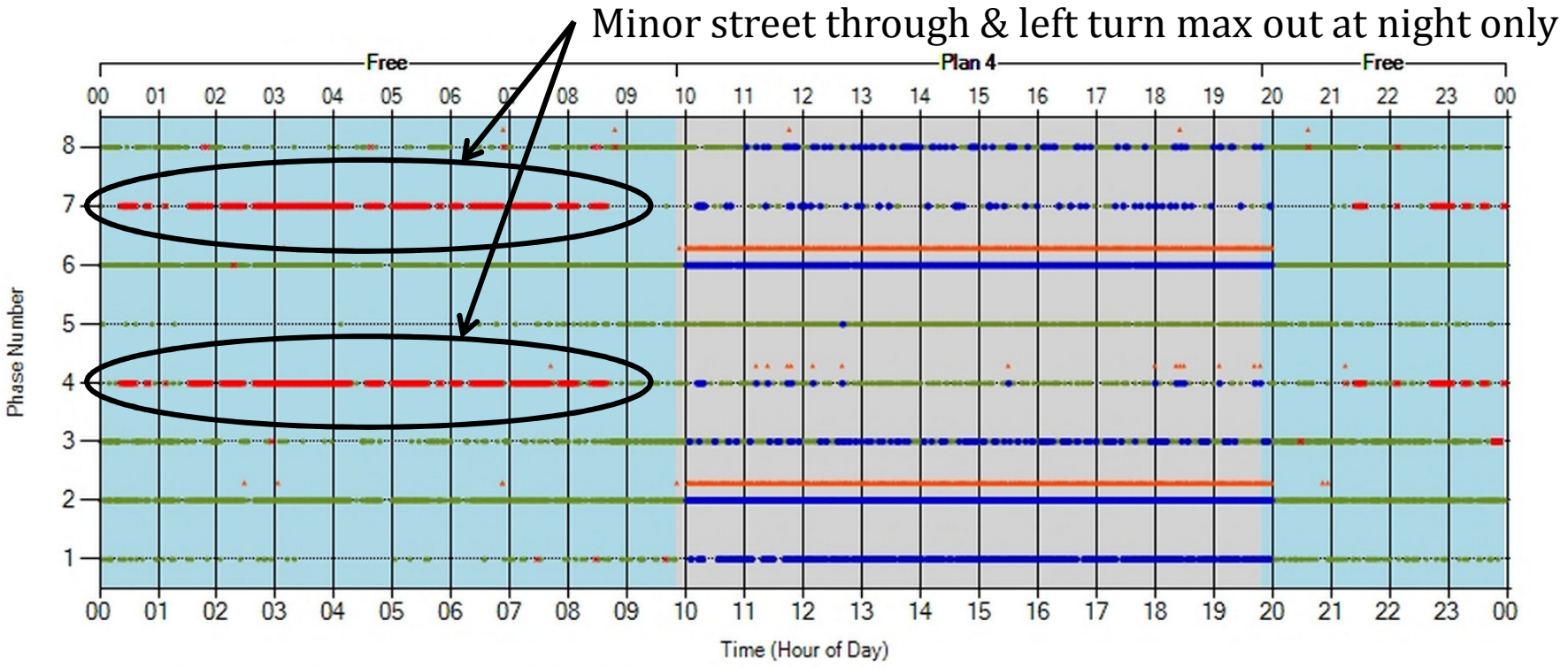
Purdue Phase Termination Chart



Detection Requirements: None

Maintenance Example: Nighttime detection problem

BEFORE: Video detection not working at night



Gap out

Max out

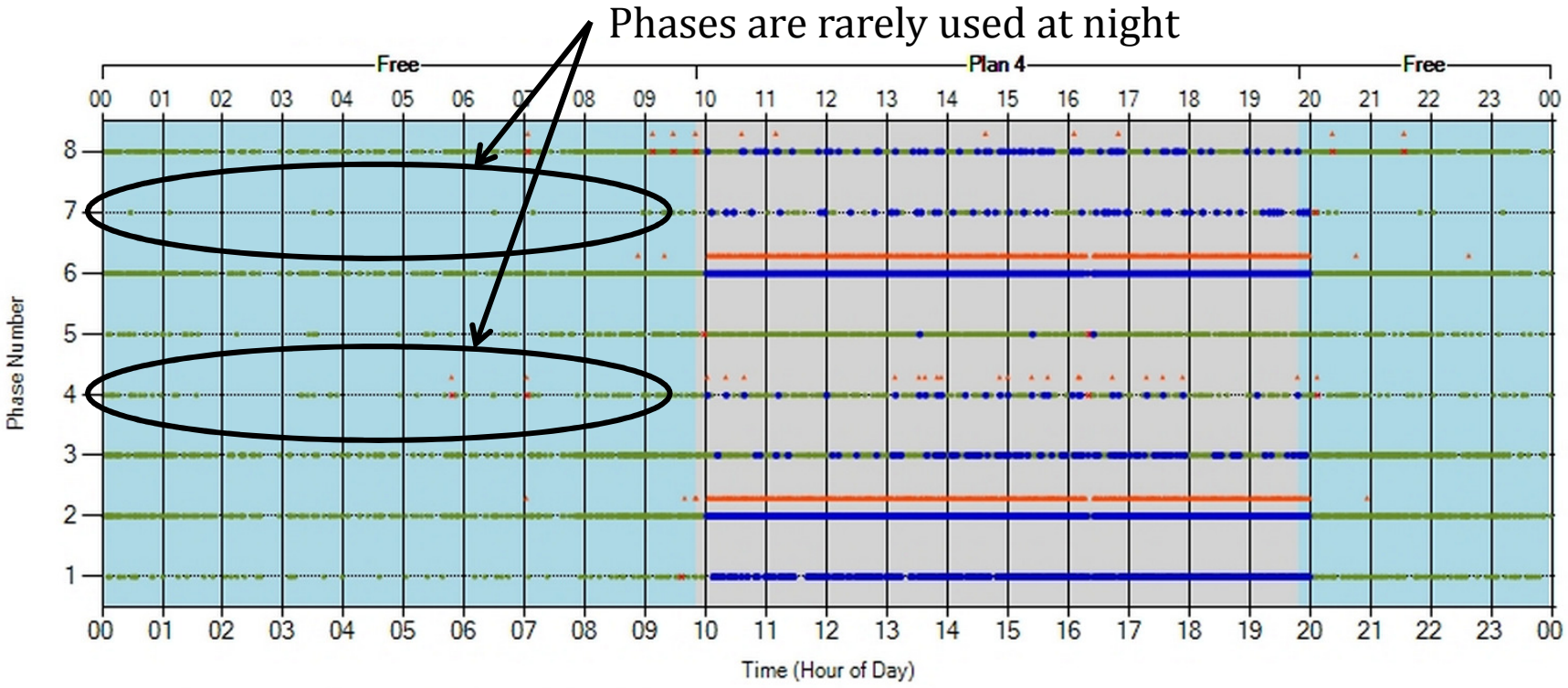
Force off

Pedestrian activation
(shown above phase line)

Skip

Maintenance Example: Nighttime detection problem

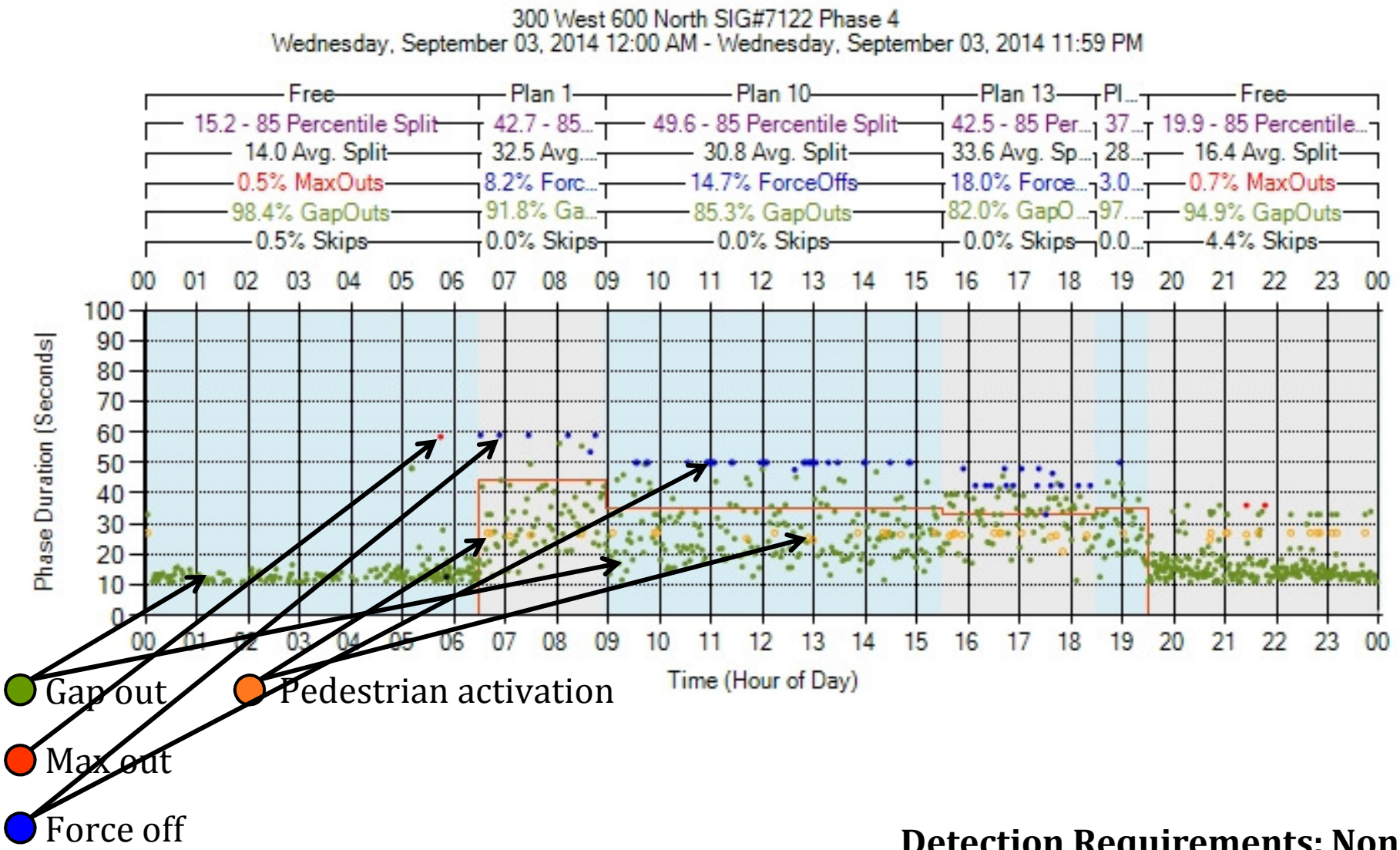
AFTER: Detection repaired



- Gap out
- Max out
- Force off
- Pedestrian activation (shown above phase line)
- Skip

Split Monitor

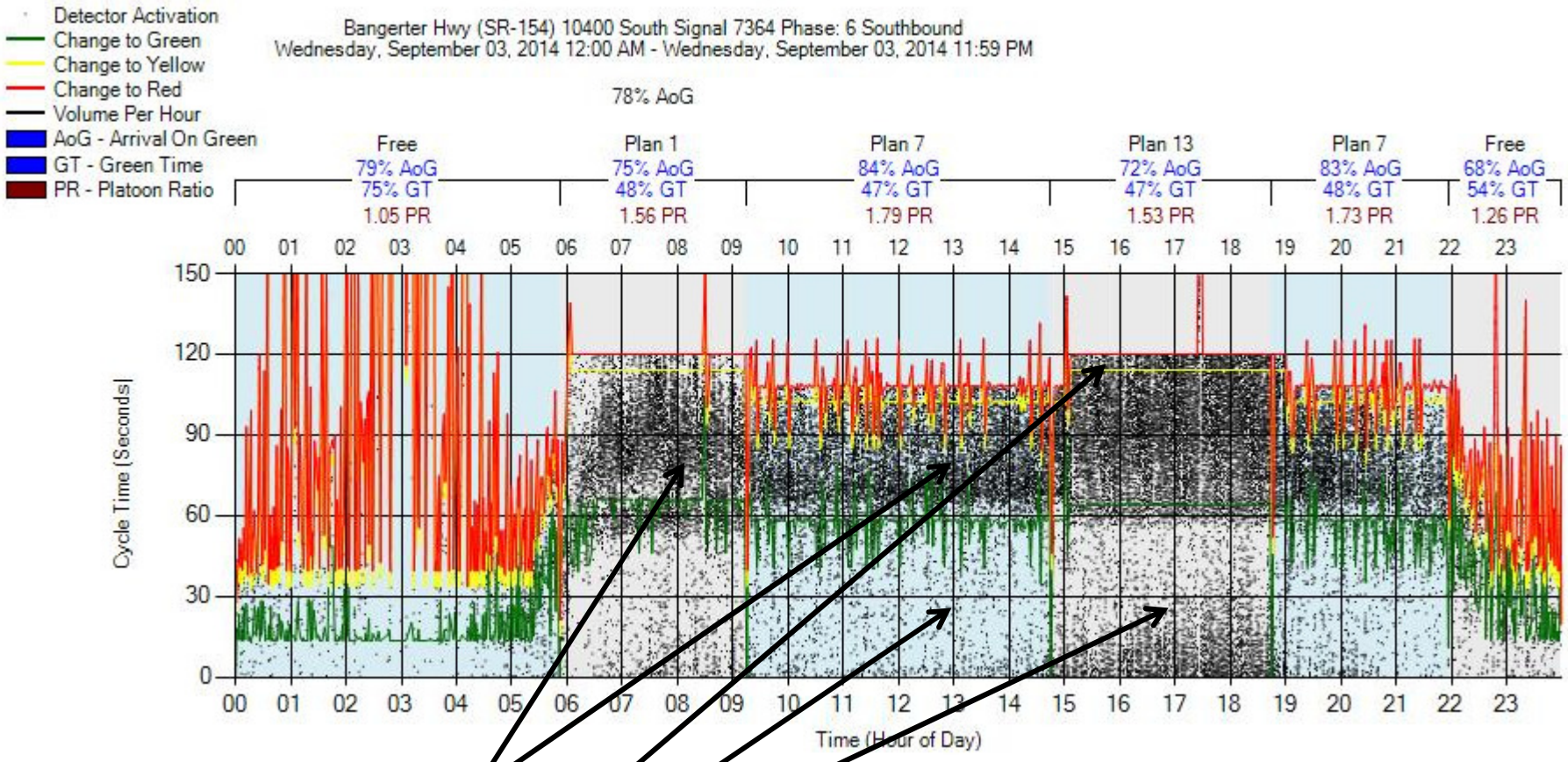
1 of 8 phases shown



Detection Requirements: None

Purdue Coordination Diagram

One approach shown



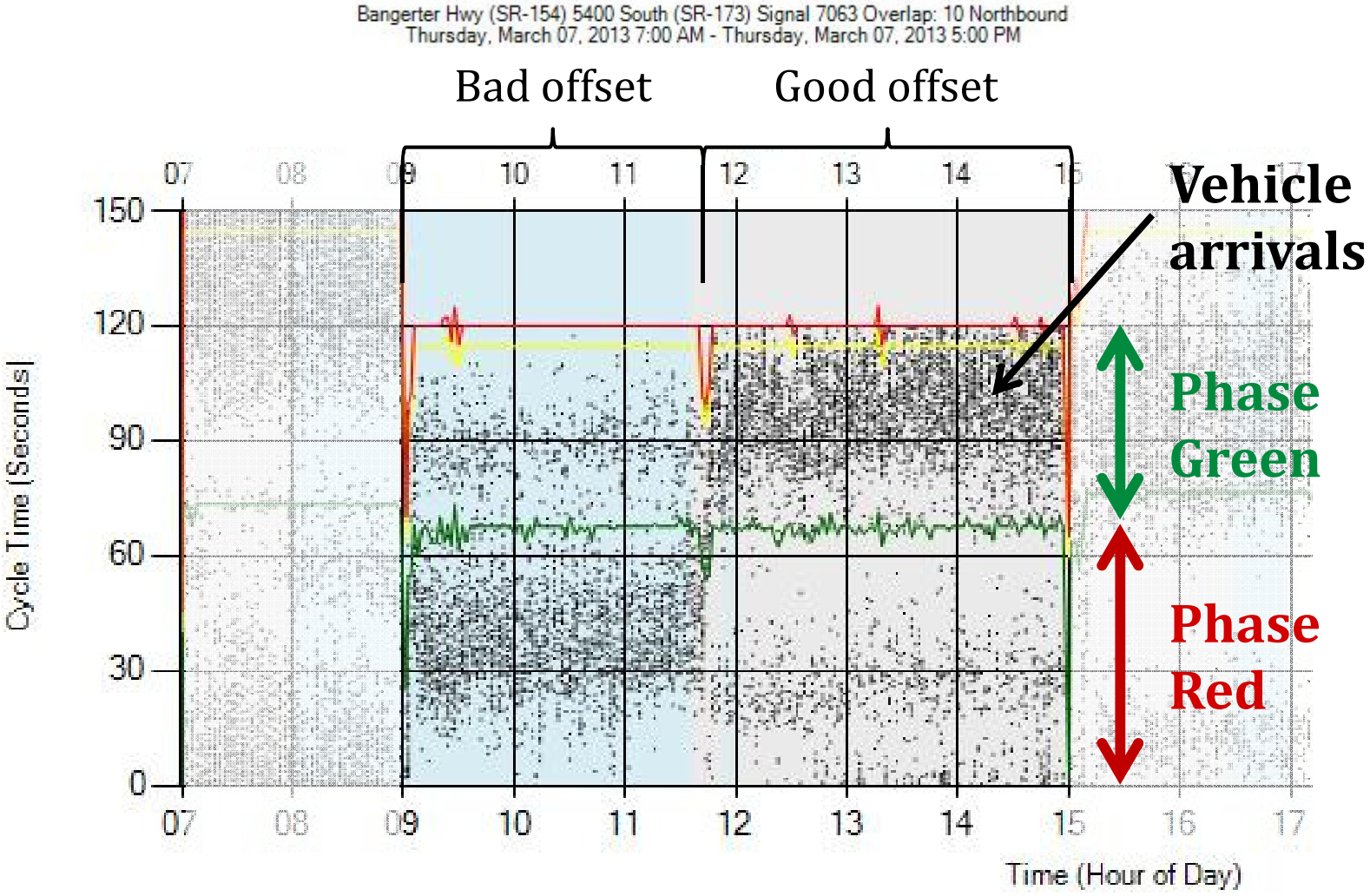
Vehicles arrive on green

Vehicles arrive on yellow

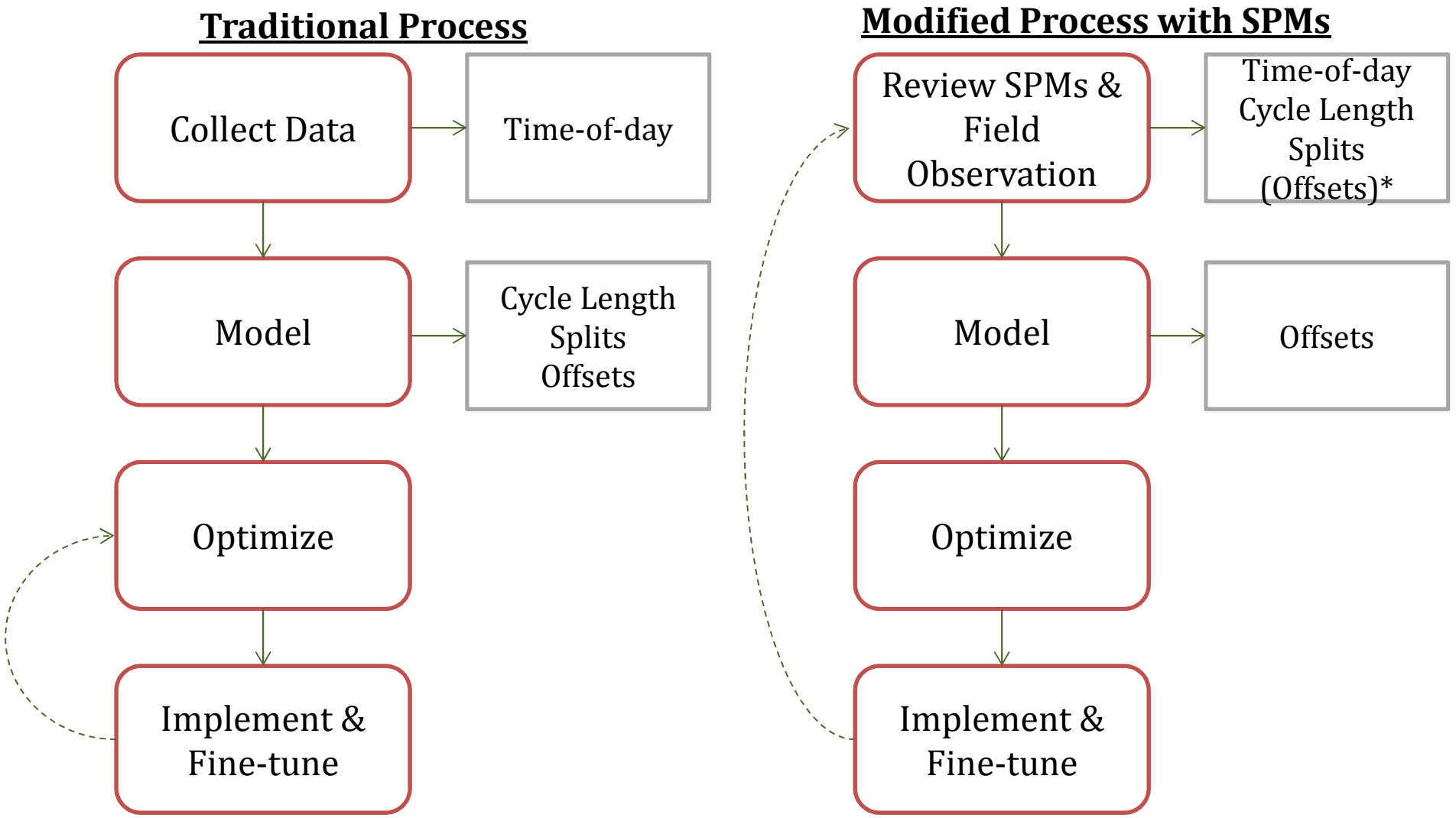
Vehicles arrive on red

Detection Requirements: Advance Counters

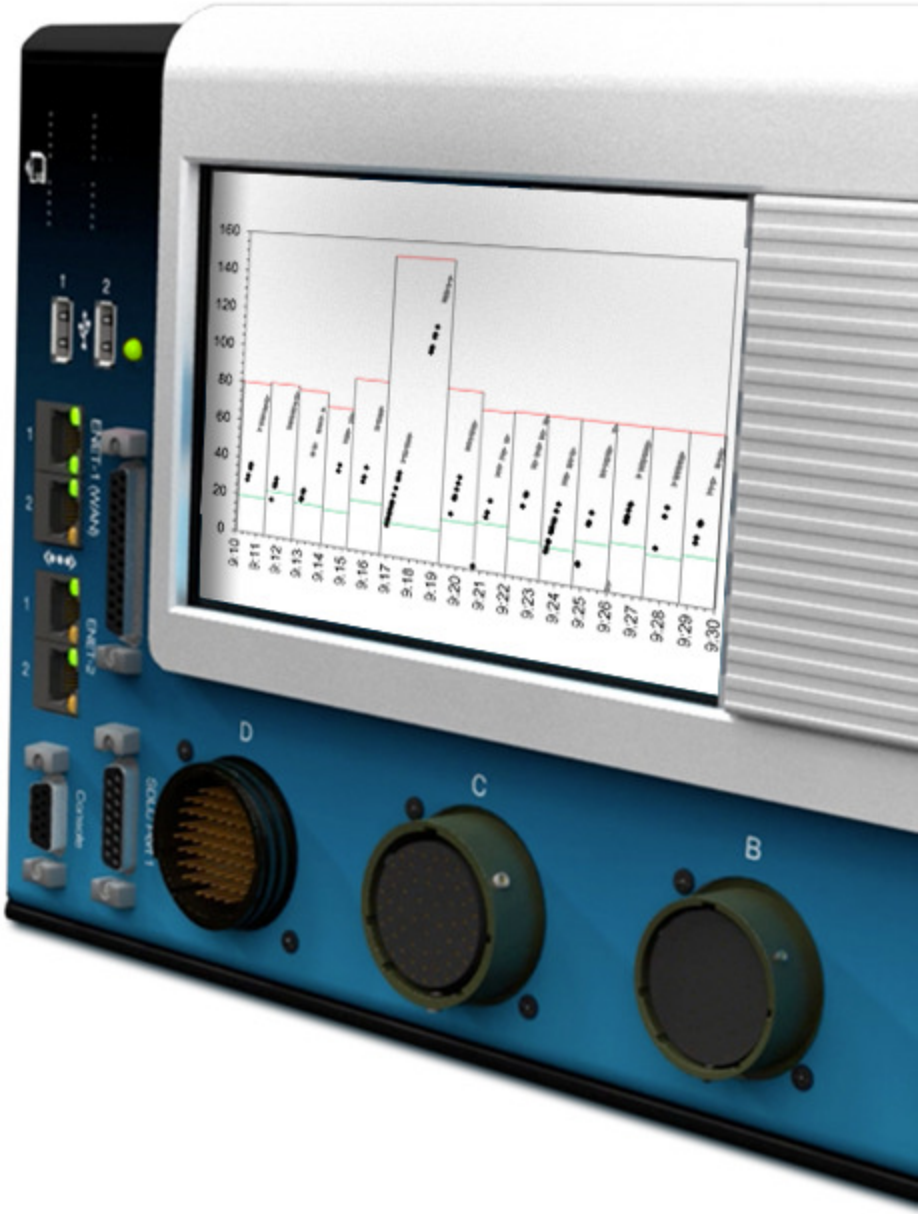
Optimization Example: Progression Quality



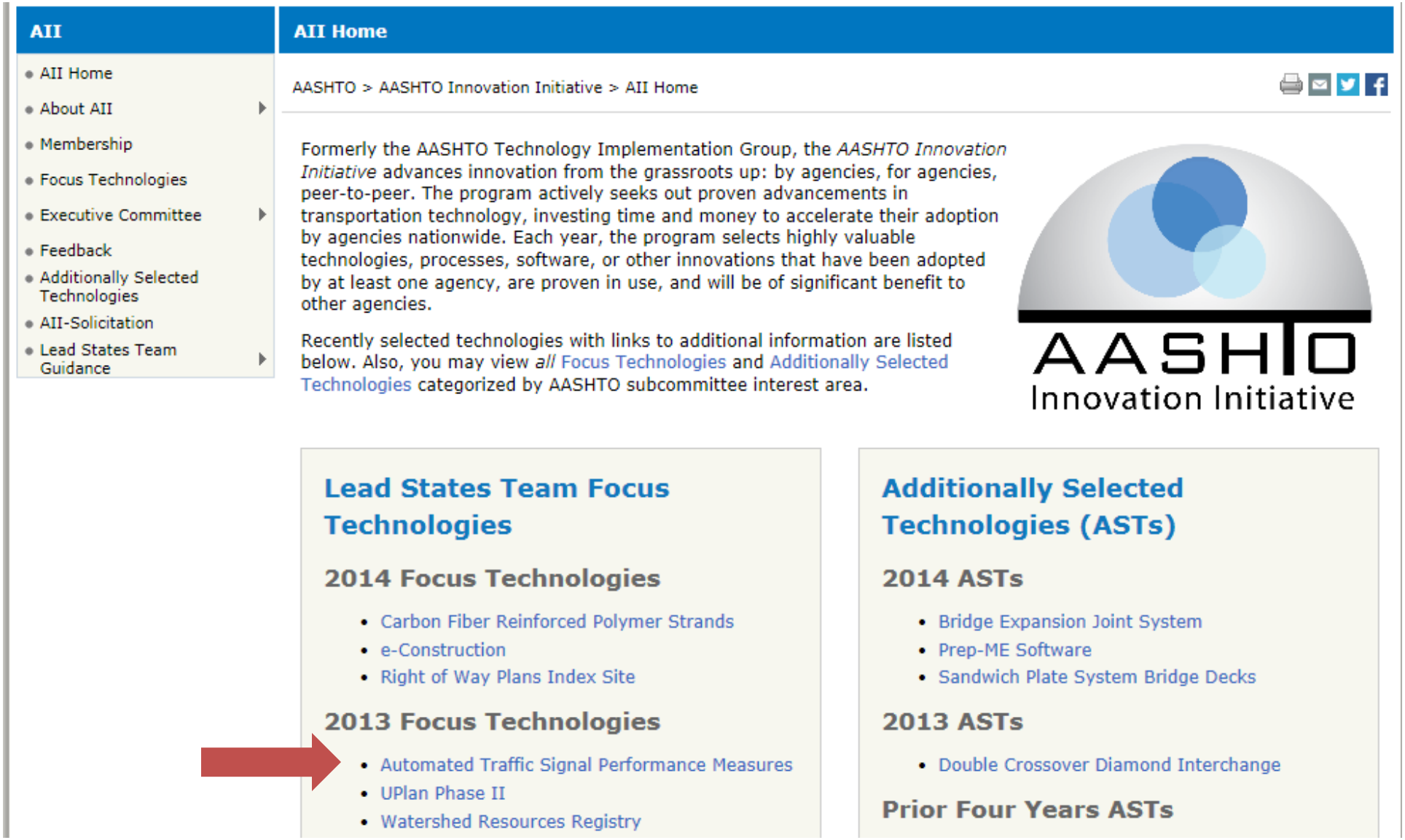
How SPM has changed our retiming process



Future of SPM?



Find out more:
http://aii.transportation.org



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UDOT Signal Performance Metrics
http://udottraffic.utah.gov/ signalperformancemetrics

Purdue/INDOT JTRP Report
http://tinyurl.com/signalmoe

AASHTO Innovation Initiative
http://aii.transportation.org